Amendments to the Specification

Kindly replace the title used in the above-identified application as follows:

METHOD FOR MONITORING LOW-RESISTIVITY FORMATION USING POLARIZED WAVES

Amendments to the Specification

Please amend the sub-heading beginning on page 1, line 8, as follows:

~~**INTRODUCTION**~~

BACKGROUND OF THE INVENTION

1. Technical Field

Please amend the sub-heading beginning on page 1, line 17, as follows:

~~**Known Art**~~

2. Description of Related Art

Please amend the paragraph beginning on page 3, line 6, as follows:

Another Patent application, NO20020202 from Statoil, also discusses delineating a hydrocarbon bearing rock layer, presumably of high-resistivity, using refracted EM waves from guided waves in that rock layer. NO20020202 correctly ~~recognises~~ recognizes that the detected refracted waves may be less attenuated than a direct EM wave or large offsets, but does not discuss using a transmitter antenna at the upper part of a casing with the casing acting as signal guide down to the reservoir.

Please amend the paragraph beginning on page 3, line 14, as follows:

NO20020202 states that a towed dipole antenna having a length from 100 to 1000 ~~metres~~ meters is preferred.

Please amend the sub-heading beginning on page 4, line 8, as follows:

~~**Purpose of the Invention**~~

SUMMARY OF THE INVENTION

Please amend the paragraph beginning on page 4, line 9, as follows:

A general concept ~~in~~of this invention is to let a metallic casing help to guide parts of the EM energy from the surface, through conductive overburden, deeply down into a high-resistivity hydrocarbon reservoir. A first purpose of the invention relates to ~~a first~~ the problem of mapping the extent of a high-resistivity layer ~~indicating a.~~ indicating a petroleum bearing rock bed, as opposed to a possible continuation of the same geological layer into a brine-saturated volume of the same rock bed, or another low-resistivity rock bed.

Please delete the sub-heading beginning on page 6, line 9, as follows:

~~**Summary of the invention.**~~

Please amend the sub-heading beginning on page 7, line 18, as follows:

~~**Short figure captions.**~~

BRIEF DESCRIPTION OF THE DRAWINGS

Please amend the paragraph beginning on page 9, line 22, as follows:

Fig. 9 illustrates a series of calculated vertical sections through another, similarly simplified model of a low-resistivity formation being covered by conductive seawater. The material model behind these calculated sections is illustrated in Fig. 9b. The image illustrates the EM propagation through a rock formation. The seafloor is situated at 2500 m depth of seawater. The rock beds of the model extend to a depth of 2500 ~~metres~~ meters below the seafloor, i.e. 5000 m below the sea surface. The horizontal extent of the model is 5000 ~~metres~~ meters. As with Fig. 4, a thinner, high-resistivity horizontal formation exists somewhere in the lower half of the image. The approximate position will emerge in the images for time section images after 2000 or 3000 microseconds, i.e. the second or third image. From the seafloor and down, the formations are penetrated by a well at the left side of each image, the well having a conductive casing,

usually ~~made in~~ made of steel.

Please amend the paragraph beginning on page 10, line 19, as follows:

Fig. 11 is a vertical section of a ~~modelled~~ modeled embodiment of the invention, an image based on a model similar to the model of Fig. 9b. An exception is that the casing used in the model for calculating Fig. 11, is short, extending from the seafloor and 500 ~~metres~~ meters down into the low-resistivity formation. Thus the steel casing ends far above the high-resistivity formation.

Please amend the sub-heading beginning on page 11, line 11, as follows:

~~**Description of preferred embodiments of the invention**~~

DETAILED DESCRIPTION OF THE INVENTION

Please amend the paragraph beginning on page 11, line 12, as follows:

Fig. 1 illustrates a situation in which an antenna 50 of an electromagnetic ~~transmitter's 5 antenna 50~~ transmitter 5 is arranged in a borehole 7b through low-resistivity formations 3, and in which the borehole 7b also penetrates a high-resistivity petroleum fluid bearing formation 2. The antenna 50 is arranged at the outside of a conductive casing 7 for transmitting an electromagnetic

signal S into the high-resistivity formation 2. As the electromagnetic waves propagate through the formations, eventually refracted electromagnetic waves are received on the surface 1 of the overburden geological formations 3. The surface 1 may be a seafloor or a land surface. The surface may, in the method of this method, not be the sea surface except for rather shallow applications, due to severe seawater attenuation of EM signals. A separation line 22 in the fluid bearing formation 2 indicates a transition from an oil-filled portion 20 of the high-resistivity formation 2 and a water-filled lower-resistivity portion of the formation 2w.

Please amend the paragraph beginning on page 11, line 27, as follows:

Fig. 2 illustrates a more detailed portion of Fig. 1, showing a portion of the casing 7 in that part of the borehole 7b penetrating the high-resistivity petroleum-fluid bearing formation 2. The transmitter antennas 50 are arranged near the casing adjacent to this penetrated high-resistivity formation 2. Independently of which particular transmitter method used to generate an electromagnetic wave intended to propagate as a guided wave inside a high- resistivity rock formation, it is essential for extensive propagation that an ***E*** field be formed near-perpendicular to an upper and lower interface between the high-resistivity rock formation 2 and more conductive layers 3 above and below. Thus, the ***E*** field generated cannot move present charges to any significant degree, and very little electrical current is formed, a current that would be quickly attenuated in the conductive layer 3. Thus, having an ***E*** field perpendicular to the interfaces above and below the high-resistivity layer 2, an **EM** wave may propagate far as a guided wave

inside of the high-resistivity layer 2. This principle applies to most of this application. As discussed above, while ~~commenting~~ commenting on the known art, we mentioned that a significant disadvantage of NO20020203 in a case of arranging the antenna in the well is, that the operation for lowering the antenna to the required depth in the well, is relatively complicated and which additionally most often requires that the well, in the case of being a production well, must be shut down temporarily. Additionally, providing electrical energy for a downhole transmitter antenna producing a significantly strong signal, arranged near the actual production zone, may be difficult. The situation of Figs. 1 and 2 is similar to, but not entirely the same as the one of NO20020203, in that the high-resistivity zone in question in this application does not "outcrop" along the seafloor in our example. However, the description below describes a solution to some of the problems discussed above.

Please amend the paragraph beginning on page 18, line 27, as follows:

Fig. 9 illustrates a series of calculated vertical sections through another, similarly simplified model of a low-resistivity formation 3 being covered by conductive seawater 4. The material model behind these calculated sections is illustrated in Fig. 9b. The image illustrates the EM propagation through a rock formation 3. The seafloor 1 is situated at 2500 m depth of seawater. The rock beds 3 of the model extend to a depth of 2500 ~~metres~~ meters below the seafloor, i.e. 5000 m below the sea surface. The horizontal extent of the model is 5000 ~~metres~~ meters. As with Fig. 4, a thinner, high-resistivity horizontal formation 2 exists somewhere in the lower half of the

image. The approximate position will emerge in the images for time section images after 2000 or 3000 microseconds, i.e. the second or third image. From the seafloor 1 and down, the ~~formations 3,2~~formations 3, 2 are penetrated by a well at the left side of each image, the well having a conductive casing 7, usually ~~made in~~ made of steel.

Please amend the paragraph beginning on page 22, line 1, as follows:

Fig. 12 is a vertical section of a ~~modelled~~ modeled embodiment of the ~~invention,~~invention; an image based on a model similar to the model of Fig. 9b, except for that in the underlying model, no casing is arranged in the borehole. Clearly, the signal is much more severely attenuated and the signal strength to be received as a refracted wave is much weaker than in the two previous examples. Comparing the effects of three different situations as described above: